

REMARKS / ARGUMENTS

Applicants request that the Examiner enter the amendment prior to continued examination of the application.

Claim Rejections under 35 U.S.C. § 103(a):

The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. See MPEP § 2141. Establishing a *prima facie* case of obviousness begins with first resolving the factual inquiries of *Graham v. John Deere Co.* 383 U.S. 1 (1966). The factual inquiries are as follows:

- (A) determining the scope and content of the prior art;
- (B) ascertaining the differences between the claimed invention and the prior art;
- (C) resolving the level of ordinary skill in the art; and
- (D) considering any objective indicia of nonobviousness.

Once the *Graham* factual inquiries are resolved, the Examiner must determine whether the claimed invention would have been obvious to one of ordinary skill in the art.

In this case, the Examiner has not properly characterized the claims and/or the references and has, therefore, not established a *prima facie* case of obviousness.

Claims 19 – 20, 26, 31, 33, 35-36 and 40 are rejected as being unpatentable over Colombo et al. ("Colombo '678"). For at least the following reasons, the Applicants respectfully contend that the claims of the instant application are not obvious in light of Colombo '678.

First, regarding claims 19 and 20 (and their respective dependents), Colombo '678 does not disclose a vapor phase silicon source. The Examiner states that Colombo '678 discloses a vapor phase silicon source at paragraphs 23-26 and claim

7. In fact, the cited portions of the reference merely disclose silicon sources, and not that the silicon sources are vapor phase silicon sources. Therefore, Applicants submit that the rejection is defective, and Applicants request that the rejection be withdrawn and the claims be allowed.

Second, regarding claims 19 and 20 (and their respective dependents), Colombo '678 does not disclose a vapor phase silicon source having a vapor pressure of at least 50 torr at about 20°C. As pointed out above, the reference does not disclose a vapor phase silicon source. Therefore, it follows that the reference does not disclose a vapor phase silicon source having a vapor pressure of at least 50 torr at about 20°C. Further, the temperature and pressure ranges disclosed by the reference (paragraph [0012]) and cited to by the Examiner are directed to the overall deposition process parameters in the chamber, not the pressure or the temperature associated with the precursors (specifically, the silicon source) in the upstream delivery system. Therefore, Applicants submit that the rejection is defective, and Applicants request that the rejection be withdrawn and the claims be allowed.

Third, regarding claims 19 and 20 (and their respective dependents), the claims require complete formation of a film without subjecting the film to a post deposition step. Colombo '678, on the other hand, specifically requires a post-deposition anneal step for the specific purpose of adjusting the nitrogen concentration and to anneal out any defects. See, e.g., paragraph [0009]. Inexplicably, the Examiner states in the Advisory Action that "the invention as claimed does not preclude a post-deposition step". Claims 19 and 20 both recite "wherein said...film is formed from the said precursors in a single step such that the...film is fully formed absent a post deposition step". The Examiner's statement is directly contrary to the clear language of the claims and is, therefore, untenable. Therefore, Applicants submit that the rejection is defective, and Applicants request that the rejection be withdrawn and the claims be allowed.

Fourth, regarding claim 20 (and its respective dependents), Colombo '678 does not disclose forming a metal silicate (MSiO) film. The Examiner states that

Colombo '678 discloses a MSiO film at paragraph 9 and claim 8. In fact, the cited portions of the reference disclose a metal silicon oxynitride film (MSiON), not a metal silicate (MSiO) film. Nowhere does Colombo '678 disclose forming a metal silicate (MSiO) film. Therefore, Applicants submit that the rejection is defective, and Applicants request that the rejection be withdrawn and the claims be allowed.

Claims 24, 29 – 30, 32, 34, 38 and 41 are rejected as being obvious in light of the combination of Colombo '678 with Buchanan '591. The addition of Buchanan '591 does not remedy the aforementioned deficiencies of the Colombo '678 reference. Further, since Buchanan '591 discloses a deposition process for a metal oxide film, on a silicon layer, and it does not teach, disclose or suggest a deposition of a MSiO or MSiN film (i.e. a layer containing silicon), as per the instant invention, Buchanan '591 either alone or in combination with Colombo '678 teaches away from the instant invention. For at least these reasons, Applicants respectfully contend that the basis for this rejection should be reconsidered.

Further, regarding claims 32 and 41 the Examiner cites to Examples three and four in columns 19-21 of Buchanan '591. Example three is directed to the deposition of a metal, metal oxide, or metal nitride, but not to the deposition of MSiO or MSiN. Therefore, Example 3 is inapplicable to claims 32 and 41. Example four is directed to the deposition of a metal silicide, but not to the deposition of MSiO or MSiN. Therefore, Example four is inapplicable to claims 32 and 41. In addition, Buchanan '591 specifically teaches the use of liquid precursors that are vaporized prior to delivery to the process chamber, and therefore teaches away from a vapor phase silicon source.

Claims 21, 25, 27-28, 37 and 39 are rejected as being obvious in light of the combination of Colombo '678 with Buchanan '591 and Oshita.

The addition of Oshita does not remedy the aforementioned deficiencies of Colombo '678 and Buchanan '591. Further, contrary to the Examiner's suggestion,

Oshita does not disclose a silicon source free of carbon. To the contrary, Oshita describes methods of depositing films using a precursor which contains carbon, namely, $\text{SiH}[\text{N}(\text{C}_2\text{H}_5)_2]_3$: $\text{SiH}(\text{NEt}_2)_3$. Oshita specifically points out the desirability of using $\text{SiH}(\text{NEt}_2)_3$ because it has a common ligand (NEt_2 – the carbon containing portion) with $\text{Hf}(\text{Net}_2)_4$, the metal source. Page 208-209; Introduction. Thus, Oshita is specifically advocating the use of a silicon source that contains carbon. To remove the carbon is contrary to a fundamental principle of Oshita and would render the process of Oshita inoperable for its intended purpose. With all respect, the Examiner's position that Oshita discloses a silicon source free of carbon is utterly untenable. Finally, it should be noted that Oshita specifically teaches the use of liquid precursors (that are introduced to the process chamber through a vaporizer or bubbler), and therefore teaches away from a vapor phase silicon source.

CONCLUSION

Accordingly, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited. Should the Examiner believe a telephone call would expedite the prosecution of the application, he is invited to call the undersigned attorney at the number listed below.

Respectfully submitted, and
S-signed pursuant to 37 CFR 1.4,

/Gero G. McClellan, Reg. No. 44,227/

Gero G. McClellan
Registration No. 44,227
PATTERSON & SHERIDAN, L.L.P.
3040 Post Oak Blvd. Suite 1500
Houston, TX 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney for Applicant(s)